

GEARTECH	QUALITY PROCEDURE	No. QP8304	SHEET 1 OF 2	
		Rev. A		
Inspection of Core Hardness		BY RLE	DATE	1/18/99
		CKD JRM	DATE	9/05/99
1.	Scope			
1.1	This procedure covers inspection of core hardness on representative test coupons for use in monitoring heat treatment of carburized gears.			
2.	Referenced Documents			
2.1	AGMA/AWEA 921-A97 Recommended Practices for Design and Specification of Gearboxes for Wind Turbine Generator Systems.			
2.2	ASTM E18 Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.			
2.3	GEARTECH Specifications:			
	CK8301	QP8301	Procedure for preparing representative test coupons	
3.	Terminology			
3.1	Representative test coupon- A coupon designed to represent the cooling rate of the teeth of a particular carburized and hardened gear.			
3.2	Core hardness- Rockwell hardness measured on the core specimen.			
3.3	Core specimen- The specimen defined in Figure 2 of QP8301.			
3.4	Specified core hardness- Hardness limits specified on the engineering drawing for the gear represented by the representative test coupon.			
4.	Significance and Use			
4.1	Load capacity- Core hardness must be maintained within specified core hardness to achieve adequate fatigue strength and fracture toughness.			
4.2	Process control- Core hardness varies with material hardenability, quench severity, and heat treat process. Core hardness measurements are useful for monitoring process control.			
5.	Apparatus			
5.1	Hardness testing machine- A Rockwell® test machine in accordance with ASTM E18 shall be used.			
5.2	Standardized test block- A test block in accordance with ASTM E18 and traceable to NIST shall be used. The test block shall be of certified hardness equal to the mid-range of the specified core hardness ± 4 HRC.			
6.	Test specimens			
6.1	Core specimen- Hardness tests shall be performed on core specimens from representative test coupons conforming to QP8301.			
7.	Procedure			
7.1	Specification conformance- The test procedure and test apparatus shall conform to ASTM E18.			
7.2	Indenter- The indenter shall be a Brale® diamond penetrator.			

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7.3	Indenter load- The major load shall be 150-kgf (1471 N).			
7.4	Inspection of indenter- The indenter shall be inspected with a microscope. There shall be no damage to the indenter tip visible at 30X magnification.			
7.5	Verification of test machine- The accuracy and repeatability of the hardness tester shall be verified before and after any hardness test is made. At each verification, five tests shall be taken on the hardness test block. The error and repeatability of the test machine shall be determined in accordance with ASTM E18.			
7.6	Calibration of test machine- If the error of the test machine exceeds ± 2 HRC it shall be adjusted. The test machine shall be considered calibrated when its error $\leq \pm 2$ HRC and its repeatability ≤ 2 HRC.			
7.7	Number of indentations- At least three hardness readings shall be made.			
7.8	Spacing of indentations- Spacing shall be in accordance with ASTM E18.			
7.9	Load application time- The major load shall be applied for at least 5 seconds after the operating lever stops.			
8.	Interpretation of results			
8.1	Scale reading- Readings shall be estimated to one tenth of a division.			
8.2	Core hardness- The core hardness shall be calculated as the mean of the measurements.			
8.3	Rounding- The core hardness shall be rounded to the nearest integer. For example, a mean of 35.5 shall be reported as 36 HRC and a mean of 35.4 shall be reported as 35 HRC.			
9.	Acceptance criteria			
9.1	Core hardness- The core hardness shall conform to the specified core hardness.			
10.	Report			
10.1	The report shall include the following:			
10.1.1	Serial number of the test machine,			
10.1.2	Serial number of the standardized test block,			
10.1.3	Identification number of representative test coupon,			
10.1.4	Indenter load,			
10.1.5	Load application time, and			
10.1.6	Core hardness.			